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In re Patent Application of

SUMIMOTO et al.

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For: FLAME RETARDANT THERMOPLASTIC RESIN COMPOSITION

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May 13, 2003

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE

This is responsive to the Official Action of February 21, 2003. Claims 1-4 are pending in the application.

The Official Action includes two prior art-based rejections directed to claims 1 and 4 only. Both rejections rely upon a primary reference in combination with various secondary references. From the Official Action it is apparent that claims 2 and 3 are free of the prior art as rejections are directed only to claims 1 and 4.

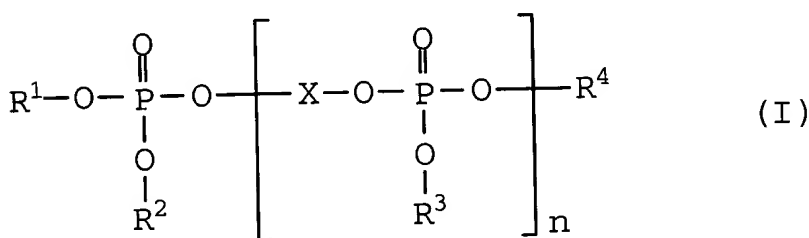
Accordingly, the rejections directed to claims 1 and 4 are now addressed. However before doing so it is important to review the objectives of the present application, the comparative evidence contained in the application as filed and then analyze the disclosures and notable deficiencies in the applied prior art.

The object of the present invention is to provide a flame retardant thermoplastic resin composition which is capable of exhibiting a flammability rating of V-2 as prescribed in UL94 and having excellent properties, especially in combination with flame

retardancy, a falling weight impact strength. The composition contains an ABS resin as a base resin and a phosphoric acid-based flame retardant.

Applicants' claims are directed to a flame retardant thermoplastic resin composition composed of (A) 100 parts by weight of a rubber-reinforced thermoplastic resin which may be a graft copolymer (A1) produced by graft-polymerizing a monomer component (b) containing an aromatic vinyl compound, a cyanided vinyl compound and, if required, another copolymerizable monomer in the presence of a rubber polymer (a) containing polymer particles having a special particle size distribution, namely a particle size of not more than 150 nm in an amount of 0 to 15% by weight, polymer particles having a particle size of from more than 150 to less than 350 nm in an amount of 60 to 100% by weight and polymer particles having a particle size of not less than 350 nm in an amount of 0 to 40% by weight. Alternatively, a mixture of the graft copolymer (A1) and a copolymer (A2) of monomer component (b') may be used. The rubber-reinforced thermoplastic resin (A) has a graft ratio of 20 to 150% and its rubber polymer content is 8 to 20% by weight.

Also present in the composition is as component (B) 5 to 20 parts by weight of a phosphorus-based flame retardant comprising a condensed phosphoric acid ester, a phosphazene compound or their mixture, in which condensed phosphoric acid ester is represented by the general formula (I):



where R¹, R², R³ and R⁴ are independently phenyl or xylenyl; X is a divalent group derived from resorcinol or bisphenol A; and n is 0.5 to 1.2. As explained in the specification and the comments that follow, in the flame retardant thermoplastic resin compositions of the present invention it is important to use a specific rubber polymer (a) having the required particle size distribution **and** to use a specific phosphorus-based flame retardant represented by the above formula. By observing both of these requirements of the claims in combination, both excellent flame retardancy and falling weight impact strength can be attained.

The specification¹ includes examples falling within these parameters as well as comparative examples falling outside these parameters. Example 1 according to the present invention contrasted with Comparative Examples 8 and 10 illustrate the technical advantages achieved by the present invention – *see* the following tables. In these tables * denotes values falling outside of the applicants' claims.

¹ The results presented in the original specification accompanied by the executed declaration signed by the inventors would have significant evidentiary weight, comparable to the weight given to an executed declaration. It is well established by the Federal Circuit that "the examiner must consider comparative data presented in the specification which is intended to illustrate the claimed invention in reaching a conclusion in regard to the obviousness of claims." *In re Margolis*, 785 F.2d 1029, 228 U.S.P.Q. 1123, 1129 (Fed. Cir. 1993).

Table 1: Properties of rubber polymer

Rubber polymer	(a-1)	(a-2)	(a-3)
Polybutadiene latex			
Particle size distribution (%)			
not more than 150nm	12	*48	13
from more than 150 nm to less than 350 nm	80	*49	*38
not less than 350 nm	8	3	*49
Gel fraction (%)	78	82	69

Table 2: Properties of graft copolymer (A1) and copolymer (A2)

	Rubber polymer		Monomer component (part)		Graft ratio (%)	Intrinsic viscosity [η] (dl/g)
	Kind	Part	Styrene	Acrylonitrile		
A1-1	(a-1)	30	49	21	115	-
A1-2	(a-1)	40	42	18	68	-
*A'1-4	*(a-2)	40	42	18	80	-
*A'1-6	*(a-3)	40	42	18	83	-
A2-1	-	-	70	30	-	0.56

Table 3: Composition and Evaluation results of flame retardant thermoplastic resin composition

	Examples 1	Comp. Example 8	Comp. Example 10
Composition (part)			
Component (A)			
(A1-1)	40	-	-
*(A1'-4)	-	40	-
*(A1'-6)	-	-	-
(A2-1)	60	60	60
Properties of component (A)			
Rubber content (%)	12	16	14
Graft ratio (%)	115	80	102
Component (B)			
(B-1)(n=1.1)	10	10	10
Component (C)	2	2	2
Evaluation results			
Fluidity (g/10 min.)	49	44	42
Izod impact strength (J/m)	14	12	11
Heat deformation temperature (HDT)(°C)	83	82	80
Burning property	V-2	V-2	V-2
Falling weight impact strength (kgf·cm)	390	90	105

As shown by this evidence and the evaluation results in Table 3, the flame retardant thermoplastic resin composition in Example 1 using the rubber polymer (a) having the particle size distribution within applicants' scope shows excellent falling weight impact strength (390 (kgf·cm)). On the other hand, the flame retardant thermoplastic resin compositions in Comparative Examples 8 and 10 not according to the invention using the rubber polymers (a) having the particle size distribution outside of applicants' claims shows poor falling weight impact strengths (90 and 105 (kgf·cm)).

Further, according to the present invention, the use of a specific phosphorus-based flame retardant represented by the above formula, that is n must be 0.5 to 1.2 to achieve acceptable results.

Contrast the heat deformation and impact strength values demonstrated in Example 5 with Comparative Examples 11 and 12 – the technical advantages are apparent.

Table 4: Composition and Evaluation results of flame retardant thermoplastic resin composition

Examples	Example 5	Comp. Example 11	Comp. Example 12
Composition (part)			
Component (A)			
(A1-1)	20	20	20
(A1-2)	20	20	20
(A2-1)	60	60	60
Properties of component (A)			
Rubber content (%)	14	14	14
Graft ratio (%)	88	88	88
Component (B)			
(B-1)(n=1.1)	12	-	-
*(B-4)(n=0)	-	12	-
*(B-5)(n=0.3)	-	-	12
Component (C)	2	1	1
Evaluation results			
Fluidity (g/10 min.)	41	79	76
Izod impact strength (J/m)	17	15	16
Heat deformation temperature (HDT)(°C)	83	72	73
Burning property	V-2	V-2	V-2
Falling weight impact strength (kgf·cm)	380	300	310

As shown in the evaluations set out in Table 4, the flame retardant thermoplastic resin composition in Example 5 using the phosphorus-based flame retardant ($n=1.1$) within applicants' scope shows more excellent falling weight impact strength (390 (kgf·cm)) and heat deformation temperature (83°C) properties than the flame retardant thermoplastic resin compositions in Comparative Examples 11 and 12 using the phosphorus-based flame retardant ($n=0$ and 0.3) out of applicants' scope (falling weight impact strength = 300 and 310 (kgf·cm), and deformation temperature = 72 and 73°C).

Therefore, by using the specific rubber polymer (a) of the requisite *particle size distribution* and specific phosphorus-based flame retardant as required by applicants' claims, the technical advantages of excellent flame retardancy in combination with falling weight impact strength can be attained.

Applicants specifically request the evidence of record be considered. Counsel observes that the requirements for reviewing such evidence are quite clear *see* M.P.E.P. 716.01, page 700-146.

On page 2 of the Official Action, claims 1 and 4 (only) are rejected over EP 0288298 B1 in view of various secondary documents discussed in further detail below. A similar rejection is presented on page 3 again directed to claims 1 and 4 only.

It is applicants' position that the primary reference has been applied without due consideration to the content of the document relied upon nor a factual explanation of the basis of how the reference provides a "nexus" between its own disclosure and the disclosures of the secondary references. Both rejections are based upon a fallacious assumption arrived at through conjecture and both rejections should be withdrawn as inappropriate both on factual and legal grounds, as explained in the comments that follow.

EP 0288298 B1 describes a thermoplastic resin composition consisting essentially of (A) an ABS graft copolymer and (B) copolymer. However, in EP 0288298 B1, as the examiner acknowledges, there is no description nor suggestion of providing flame retardancy characteristics to the ABS resin. The Examiner argues "However, EP

discusses molded articles for home electrical appliances at page 2, line 19, and thus the use of a flame retardant would be a *prima facie* obviousness.". In the cited reference, there is no suggestion that flame retardancy is required for home electrical appliances. No factual basis is provided for this statement hence it is mere conjecture.

Further, in EP 0288298 B1, on page 5, lines 30-31, there is a description that "The thermoplastic resin composition of this invention can further comprise conventional additives, coloring agents, stabilizers, antistatic agents, plasticizers, for conventional plastics.", however there is no description nor suggestion that a flame-retardant may be present. Broad conclusory statements standing alone are not "evidence" – see *In re Dembiczak*, 175 F.3d at 999, 50 U.S.P.Q.2d at 1617 (Fed. Cir. 1999).

Applicants submit that the above Examiner's statement is made after having knowledge of the present invention because there is no suggestion relating to flame retardancy. Instead the Examiner insists that home electrical appliances require flame retardancy and this statement does not arise from the cited reference.

The deficiencies in the primary reference alone are sufficient grounds to withdraw both rejections. However, for the sake of completeness additional observations and comments are provided on the secondary references. Both rejections are based upon modifications to the various documents cited and applied in the Official Action.

In assessing and responding to these rejections one must bear in mind the relevant standards for doing so. The mere fact the references can be modified or combined is not enough. As stated by the Court in *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783-1784 (Fed. Cir. 1992)(emphasis added):

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggests the desirability of the modification.

Thus, the mere fact that references can be combined or modified (Applicants believe they cannot be) does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed.Cir. 1990); MPEP § 2143.01. Hence, the Examiner's attempt to combine the cited references alone without any suggestion in the references of the desirability of the modification is improper and should be withdrawn.

Turning now to the specific references applied in the Official Action, Jang discloses a flameproof thermoplastic resin composition comprising: (A) 100 parts by weight of a rubber modified styrene-containing base resin composed of (a₁) 20 to 100% by weight of a styrene-containing graft copolymer resin, and (a₂) 0 to 80% by weight of a styrene-containing copolymer resin; (B) 5 to 40 parts by weight of a phenolic resin; (C) 3 to 40 parts by weight of a polyphenylene ether resin having a hindered phenol structure; and (D) 5 to 30 parts by weight of an aromatic phosphoric acid ester having a hindered phenol structure.

The object of Jang is to provide a thermoplastic resin composition which has flame-retardancy, a flameproof thermoplastic resin composition which is heat resistant and a flameproof thermoplastic resin composition which does not contain a halogen-containing compound which causes the environmental pollution during the preparation or combustion of the resin.

Jang provides no description nor suggestion that by using the rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination.

Further, Jang requires the use of specific types and combinations of resins, namely, (B) phenolic resin and (C) polyphenylene ether resin having a hindered phenol structure together with (D) aromatic phosphoric acid ester having a hindered phenol

structure, otherwise the objects of Jang cannot be attained. By contrast, in the present invention, by using a rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination. Therefore, the present invention is completely different from Jang in the objective, means for attaining the objective and technical advantages obtained therefrom.

Itoh discloses a laser marking resin composition having a good appearance when molded as an article and impact resistance which consists of (A) 100 parts by weight of a rubber-reinforced vinyl resin, and (B) 0.01 to 40 parts by weight of at least one compound selected from (B-1) titanium black, (B-2) black iron oxide and (B-3) yellow iron oxide.

The object of Itoh is to provide a laser marking resin composition in which a specific metal-containing compound is added to a rubber-reinforced vinyl resin, whereby markings having a suitable degree of coloration and sharpness are obtained upon irradiation with a laser without deteriorating the appearance of the molded article and impact resistance which are the features characteristic of the rubber-reinforced vinyl resin. Itoh is not concerned with flame retardancy.

Itoh provides no description nor suggestion that by using a rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination.

Itoh has different objectives and required components, namely, (B) at least one compound selected from (B-1) titanium black, (B-2) black iron oxide and (B-3) yellow iron oxide together with rubber-reinforced vinyl resin – only then can the objects of Itoh be attained. On the other hand, in the present invention, by using a rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination. Therefore, applicants' claims are completely different

from Itoh in objective, means for attaining the objective and technical advantages obtained therefrom.

Fuhr discloses a thermoplastic polycarbonate moulding compounds containing:

- A) 40-90 parts by weight of a thermoplastic aromatic polycarbonate,
- B) 0-80 parts by weight of a copolymer or polycondensate,
- C) 1-25 parts by weight of a graft polymer,
- D) 1-30 parts by weight of phosphoric acid esters of phenols, bisphenols and/or polyphenols, and
- E) 0.05-5 parts by weight of anti-dripping agents,

Fuhr's object is to provide a thermoplastic polycarbonate moulding compounds with flame-resistant properties. Only a small amount of graft polymer is used. Moreover, Fuhr is a polycarbonate composition not a graft polymer such as ABS resin composition.

Fuhr includes the deficiencies of the other citations, that is there is no description nor suggestion that by using a rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination.

Instead in Fuhr, only using A) thermoplastic aromatic polycarbonate, B) copolymer or polycondensate, D) phosphoric acid esters of phenols, bisphenols and/or polyphenols, and E) anti-dripping agents together with C) graft copolymer, are the objects of Fuhr attained. On the other hand, in the present invention, by using a rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination. Therefore, the present invention is completely different from Fuhr in the objective, means for attaining the objective and technical advantages obtained therefrom.

Even assuming the cited references can be appropriately combined (applicants do not) the resulting combination still fails to meet applicants' claims. As discussed above in

EP 0288298 B1, the Examiner's statement that "However, EP discusses molded articles for home electrical appliances at page 2, line 19, and thus the use of a flame retardant would be a *prima facie* obviousness." is made after having knowledge of the present invention because although there is no suggestion relating to flame retardancy, the Examiner insists that the home electrical appliances require flame retardancy. There is no suggestion relating to flame retardancy in EP 0288298 B1. Nor is this reference even concerned with improving falling weight impact strength.

The "secondary" references of Jang, Itoh and Fuhr provide no description nor suggestion that by using a rubber polymer (a) having the specific particle size distribution and specific phosphorus-based flame retardant in combination, excellent flame retardancy and falling weight impact strength can be attained in combination.

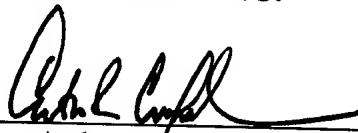
This record fails to establish any motivation to combine EP 0288298 B1 with Jang, Itoh and Fuhr.

For the above reasons, it is respectfully submitted that the claims of this application define inventive subject matter. Reconsideration and allowance are solicited.

Respectfully submitted,

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